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HULL AND CARGO SURVEYORS, INC.
INLAND MARINE - INSPECTIONS - LOSS PREVENTION - SHIP & AIR CARGO
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June 23, 1982

Mr. Steve Hastings
National Park Service
Golden Gate National Recreation Area
Fort Mason
San Francisco, Ca 94123

RE: SFH 82009
"HERCULES"
Hyde Street Pier
National Park Service
Order # PX8140-2-0532

On May 3, 1982 a request for survey was made by Mr. Steve Hastings, National Park Service, Golden Gate National Recreation Area, Fort Mason, San Francisco, California 94123.

On May 6, 1982 and subsequent dates the undersigned surveyed the above captioned vessel in preparation for drydocking.

General

Vessel is berthed port side to, on the east side of the Hyde Street Pier. Pier itself is in poor condition. Batter piles, chocks and pier piles heavily deteriorated due to normal wear, lack of refurbishment and the vessel Hercules alongside.

Though vessel appears to be moored securely, weather exposure and surge in this area are considered high as evidenced by wear on the vessel's mooring bitts and associated mooring lines.

During our inspection we found stray electrical current in the water surrounding this vessel. Inspection of the entire pier for stray current

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indicated a steady flow of approximately 1 to 3 volts along the pier length.

Vessel's general condition at this time is considered fair. Volunteer labor is presently used in up keep and refurbishment of the cosmetics and minor hull and machinery work. Main engine appears intact and operable though associated machinery, pumps, piping and valves were noted in various stages of deterioration and disassembly for restoration. As stated most work sighted is felt to be due to the on going efforts of the vessel volunteers.

General Dimensions:

Loa	150ft
Beam	27ft
Depth	15ft
Gross Tonnage	414
Net Tonnage	221

General Description

This is a riveted steel single screw tug boat built in 1907 by John H. Dialogue and Sons, Camden, New Jersey. Hull and bulwarks are painted black. Decks and house are red and the wheel house is white.

Vessel is of the classic lines of those operating at her time. Vessel has a high shear with straight stem and rounded transom.

Vessel is divided into seven compartments. Four compartments, P/S fuel tanks, forepeak and two aft tanks have watertight bulkheads. At the time of our survey all tanks but the fuel tanks were pumped dry and gas freed for our inspection.

Configuration

First; water tight fore peak tank. Chain locker and fo'c'sle next. Non watertight bulkhead separates chain locker and fo'c'sle from boiler room. Fuel tanks are next constructed integral with the hull. Engine room is next separated by watertight bulkhead. Aft of engine room, are two ballast tanks.

Main working deck, H bitt forward with double drum windless on fore deck. House noted with salon and galley forward. Next, boiler room access, crews quarters port/stbd. The towing winch is aft of engine room enclosed under the house. Steering quadrant is exposed and driven through chain and solid rod linkage port/stbd, house along the working deck.

Above house is single steel mast through stepped to tank top in engine room. Two pulling boats with davits port and starboard. Operators cabin noted just forward of stack. Steam powered steering engine located directly under raised wheel house, forward of operators cabin.

Forepeak Tank

#1 Port side shell frame waved at top of frame.
#1 Starboard side shell frame adrift from transverse deck beam, wastage of 1/8 inch noted, 50%.
#2 Transverse deck beam wave port side at deck bracket.
#3 Transverse deck beam waved at brackets P/S.
#4 and 5 side shell frames, diagonal stiffeners and frames in way of deck mounted hardware noted wasted 50% at frame attachments.
Limber holes in bottom transverse frames plugged with paint chips and debris, bottom plate and frames not sighted.
Number 1 swash plate at and on frame #4 waved and distorted.
Between side shell frames 6 and 7 shear strake shell plate waved and distorted.

A plywood patch covered with red hand noted on bulkhead #8, port side under first longitudinal frame. A poorly finished plug weld noted starboard side under first longitudinal frame from working deck. White epoxy covers areas above and below plywood patch. Epoxy covers riveted seam. Epoxy noted flaked and peeling rivets in way of bulkhead generally good though some in way of man hole are 50% wasted.

Fo'c'sle

At bulkhead #8 port side, at riveted seam, bleeding noted at rivets in area of plywood patch fore peak tank.

At bulkhead 8, transverse frame slightly tripped, heavily rusted and holed due to water from above.

Port and starboard diagonal posts for above deck machinery wasted 50% at joint to side shell frame. Rivets missing area welded.

Diagonal at frame #10 waved and distorted.

Between frames 11 and 12 port at and above side longitudinal shell plate, waved and distorted.

Transverse deck beam 11 bent. Beam has been inserted and welded.

Frame 12 port, waved at deck level.

Between frames 13 and 14 port, weeping from holes in working deck.

Frame 16 port, waved between side longitudinal frames.

Frame 19 port, slight wave in frame.

Deck beam 21 port sagging at insert.

Frame 21 port slightly waved.

Between frames 21 and 22 port, at transverse deck frame. Longitudinal bowed and distorted.

Bottom longitudinal port side, at bulkhead 23 rusted, longitudinal is mushroomed.

Frame 20 port, below side longitudinal frame, wasted 50%.

Frame 18 port waved and distorted.

Between frames 18 and 19 port deck longitudinals mushroom and rusted.

Frame 16 port waved and distorted.

Frame 14 port waved and distorted.

Concrete covers bottom frames and shellplate throughout.

Frame 11 port adrift from transverse bilge frame, frame holed through.

Transverse bottom frame 11 limber hole plugged with concrete.

Frame 12 port at transverse bottom frame. Frame heavily wasted as it enters concrete/

Between transverse bottom frames 9 and 10 limber hole plugged.

Between frames 8 and 9 transverse bottom frame filled with concrete.

Keelson bracket at bulkhead #8 connected with red hand.

Keelson at bulkhead #8 waved and lifted.

Frame 9 starboard diagonal post, one rivet holding the frame together.
Heavy wastage this area.

Frame 17 port, weeping noted from under frame.

Vertical post port side at frame 17, support for water tank, bracket waved.

Frame 18 port waved at transverse bilge frame.

Frame 19 port, shellplate set up between frames 18 and 19 below wood deck planks, rivets missing.

Transverse bottom frame 18 wasted through web of frame.

Frame 20 port waved at bottom, embedded in concrete.

Sections of bulkhead 23 wasted in area of keelson. Keelson bracket heavily corroded.

Frame 16 starboard, bracket between bottom and side frame heavily wasted.

Frame 15 starboard at bracket, 3 of 5 rivets missing.

Diagonal frame at frame 15 wasted heavily. Holed due to corrosion at frame attachment.

BOILER ROOM

At bulkhead #36 fuel tanks, cross over valves at keelson leaks ahead and behind valve stem. Bulkhead rivets this area leaking.

Longitudinal deck beam above boiler wasted 50%.

Port and starboard of keelson and under boiler filled with concrete.

Keelson wastage in boiler room approximately $\frac{1}{4}$ ".

Keelson brackets at bulkheads 23 and 36 wasted 60 to 70%.

Transverse deck frames under diamond plate 50% wasted and scale.

Transverse frames wood coffer dammed and filled with concrete.

All side shell plate frames are covered with concrete from keelson P/S 15 feet. Salting and mushrooming of most frames noted as they exit concrete.

Light to moderate scale of boiler cradel. One boiler nut at bulkhead 23 corroded.

Frame 30 starboard under and including boiler cradle heavily scaled. Hole in boiler noted center line aft. Could be a plug or rivet missing.

General inset of shellplate noted in way of frame 24 starboard, between 1 and 2 side longitudinal frames.

General inset of shellplate between frames 24 and 25 starboard above second side shellplate longitudinal.

Deck beams 28 and 29 at brackets starboard are waved.

Side shellplate frames 32 and 33 in way of CO₂ system, waved and distorted there length.

Between frame 30 and 31 starboard, between side shellplate longitudinal and working deck. Rivets and shellplate wasted, 50%.

Deck above boiler holed between frames 27 and 30 starboard. Port light had been installed in this area, since removed and doubled over.

Frame 25 starboard at working deck frame is opened rivet shank exposed. Doubler has been added over this area.

Frame 24 starboard tripped at working deck.

At frame 27 deck beam above boiler heavily wasted.

Longitudinal deck frames P/S between bulkhead 23 and frame 27 wasted 50% and greater.

FUEL TANKS

Tank survey will be performed in dry dock. Tanks to be pumped dry mucked out and gas free.

ENGINE COMPARTMENT

At bulkhead 50, engine room/fuel tank bulkhead. Bulkhead scaled and discolored at transverse bottom frame, seepage is apparent.

Fifteen inches of water in bilge under main engine. Heavily corroded diamond plate make inspection of most bottom internals physically impossible. Visually wastage to diamond plate and supports indicated at 50% and greater. Inspectable areas found filled with concrete.

Port longitudinal engine mount slightly waved in web. Corrosion has holed top of frame.

Main wood beams supporting house are rotten due to water leaking from above. Areas of heaviest rot include deck beam aft of mast #65 port. 64 port is split and sistered, sister is split. Steel deck beam 63 bend and distorted middle of frame.

Machinery room is divided upper and lower by cat walk at working deck level allowing access to engine all around. Aft at cat walk level is a wood lined tool room extending to aft water tight bulkhead.

At bulkhead 69 oil leaking from rivet. Not a fuel tank.

Starboard side rivet heads at bulkhead 69 wasted 35% between 1 and 2 side longs.

Heavy salting found between frames 64 and 65 starboard just above side longitudinal #2.

Through hull at head heavily wasted.

Frame 54 starboard, slight wave at working deck. Deck frame and bracket bowed.

57 starboard slight wave at working deck.

58 starboard frame waved between working deck and #1 side long.

Above electrical panel starboard side. Conduit through deck and associated steel decking rusted and corroded.

Frame 54 port slight wave at brackets. Transverse house frame heavily scaled portside.

Between frames 56 and 57 port shell plate inset $\frac{1}{2}$ to 1" just above side shell longitudinal.

Between 57 and 58 port. Above through hull flange a $\frac{1}{2}$ to 1" inset noted.

LOWER ENGINE ROOM

Consisting primarily of moving machinery, day tanks, pumps, shafts and thrust block.

Fuel tank bulkhead 50 was holed port side lower with a chipping hammer. Area was patched and strong back added.

Areas port and starboard below diamond plate show heavy staining, indicating further deterioration this area.

#51 transverse bottom frame at forward bulkhead heavily wasted, frame top waved and distorted.

Port longitudinal engine mount, holed in top, wasted 50%, slight wave in webbing.

Frame 52 port waved below first side long.

Bottom diamond plate at frame 58 heavily wasted most supports have been either replaced or are in need of same.

Port and starboard bilge piping in way of frame 64 wasted below diamond plate.

Bulkhead 69 at transverse deck frame, wood has trapped water on frame causing some deterioration to bulkhead and bulkhead frame.

Transverse deck beam 68 tripped at bracket.

Frame 67 starboard slight wave between bracket and first longitudinal,

Transverse deck frame 64 moderately rusted.

Slight wave in frame 63 starboard.

59 Starboard slight wave in frame.

58 Starboard slight wave in frame.

57 Starboard slight wave in frame.

55 Starboard slight wave in frame below longitudinal.

Bulkhead 69 some leakage stains noted starboard at rivet heads. Heads wasted 35%.

Between frames 65 and 64 salting noted just above side long #2.

Bleeding noted throughout vessel port and starboard from holes in working deck and leaking from house roof.

MIDDLE AFT TANK

Tank appears to be in reasonably good condition though heavily scaled. Tanks is normally pressed up, drained for our inspection. Red hand noted and liberally applied port side above longitudinal frames. Suction and cross over piping for aft peak tanks heavily scaled.

Frame 76 starboard waved and distorted to first longitudinal frame.

Frame 66 starboard waved to first longitudinal.

Frame 72 port and bracket waved to first long.

Between frames 72 and 73 port, swash plate and bottom frames waved.

Concrete noted between transverse bottom frames 75 and bulkhead 76.

At bulkhead 76 deck bitt through bolts, in need of renewal.

AFT PEAK TANK

Valve noted interior at man hole for liquid transfer to mid tank. Valve is operational. It is felt that reach rod should be above deck to allow transfer without uncovering man hole. Deck bitt bolts and rudder chain turning block bolts heavily scaled.

Rudder tube is 12 inch pipe flanged and riveted through working deck. Embedded in concrete through bottom shell plate. Solid square stock is welded to the leading edge of the tube from deck to concrete.

Most bottom plate in this tank is concrete coated. A slight wave in starboard frame bracket 78 was noted. Piping and flanges for liquid transfer are felt to be in need of renewal.

TOOL ROOM

Tool room located upper engine room between frames 61 and bulkhead 69.

Heavy corrosion noted to working deck above in way of previously installed vent, since doubled over.

Area of working deck in way of towing winch motor, corroded. Flange bolts in way of drive shaft corroded, one washer fractured.

Heavy paint peeling noted but generally good steel.

Starboard side at tool bins, heavy salting of rivets and bleeding of shell plate at seam, between frame 65 bulkhead 69.

WORKING DECK

Working deck is heavily pitted and appears to have been doubled and tripled over its entirety. Deck at house and at shear is deteriorated and holes allow water to the interior bulwarks, rails and deck drains are heavily

deteriorated.

Windlass on fore deck, casing port side fractured. Port and starboard through deck bolts sheared.

Cover guard for steering rods, rods, chain and all blocks heavily deteriorated. Exposed quadrants on after deck radius arms have been doubled and welded over.

Starboard companionway to wheel house is heavily deteriorated in area of steps, and cabin top.

Wood house roof in area just aft of boiler room port side rotten and deteriorated due to gangway slamming into it. Water leakage has caused steel framing deterioration in this area.

Bolts for name plates port and starboard bow have corroded due to lack of bedding compound against hull.

Ladder rails for stack extremely deteriorated.

Vent skirt and stack heavily corroded.

Port and starboard hand rails and stanchions deteriorated.

Scuppers on house roof need flange around scuppers, wood soft.

Mast is heavily pitted.

Standing rigging noted as 7/8 inch poured sockets, secured to mast and stack, turnbuckles shackles etc., in need of replacement. Chain plates in need of rebedding.

Submitted without prejudice to whom concerned.

HULL AND CARGO SURVEYORS,

Bruce Cibley

BC:mab



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November 23, 1982

SFH 82009 - Supplemental Report
Tug "HERCULES" Ref., Order # PX-8140-2-0532
Golden Gate National Recreation Area

See report dated June 23, 1982

Drydocking:

Vessel was towed from Hyde Street Pier to Pacific Dry Dock and Repair Company, Oakland, California on Monday, September 13, 1982. Preliminary work consisting mainly of fuel tank cleaning was accomplished with vessel alongside pier afloat.

During drydock period, the vessel was sandblasted from keel to rub rail, lower hull and waterline area thickness gauged from outside, a waterline doubler strake was added to hull, suspect rivet heads were epoxy filled, sea chests and overboards below water line were opened and renewed, head overboard discharge removed and blanked, lower rub-rail partially renewed and hull coated with primer, 2 coats of anti-corrosive and 2 coats of anti-fouling to boot top.

Simultaneous interior work on renewing and caulking fuel tank bulkheads, fore and aft peak tank bulkheads, renewing boiler uptakes, renewing anchor windlass and partially renewing bulwark was accomplished while on dry dock. The interior and deck work was completed after vessel was refloated and bulwarks and rub-rail sandblasted and coated inside and out.

Vessel was returned to Hyde Street Pier on November 15, 1982. New anchors had been set for her mooring during above period.

Gauging:

Preliminary gaugings had been accomplished from hull interior before dry-dock period. Exterior gaugings were taken in four belts around hull approximately 18 inches above and below waterline and 1 foot above keel and 5 feet above keel.

All of the above readings are summarized on attached sketches of vessel's profile.

It is felt that hull has good structural integrity based on minimum thickness at about .250 inches on the average and ranging up to almost .500 inches. However, it is noted that small localized pitting has actually produced holes up to $\frac{1}{4}$ " in diameter at some few places on hull plate. Everyone of these places (about 6 in number) which were noted at this time were clad welded to bring steel plate back to average thickness. It is felt that current coating and maintenance schedule should prevent further deterioration but it is recommended that hull be examined at each drydock period and pits welded up. Furthermore, unless cathodic protection is installed, there is a good possibility of further pitting at any pinhole in coating.

Doubler Plate:

Since waterline area is subject to most severe deterioration and many thin areas had been noted, it was decided to provide a 3 foot wide belt of 5/16" doubler plate around entire hull. This was, for appearance sake, made to resemble an "ice protection belt" as commonly installed on tug boats.

Doublers were completely edge welded, bolted through every third frame with bolt heads ring welded and air tested for integrity. Leaks along welds were gouged and rewelded and void between doubler and shell pumped full of Devran 230 anti-corrosive.

It is felt that this is a structurally sound repair that should protect waterline area on a permanent basis.

One small area of severe wastage from interior drip was found in way of paint locker in shop area on stbd. side below waterline. A doubler extending past two frames involved was welded over this area from waterline doubler plate to lapped butt below.

Rivets:

Rivets were randomly tap tested for integrity. They were found generally tight but about 30% were found to be grainy from corrosion. It was decided to seal these with an epoxy compound to prevent further deterioration and to strengthen connections.

Sea Cherts:

All sea chests were opened and examined. All were found to be sound and were cleaned only. Valves were renewed and hydro tested for integrity. Intake at main circulation was found with sheared stock which was repaired.

Stern Tube:

Packing was renewed at stern gland. Bearings were examined without removals and it was found that shaft and bearings had been renewed at some point without much service since renewal.

It is felt that shaft and bearings are in good condition in so far as can be determined without removal and run-out.

Fuel Oil Tanks:

After cleaning of fuel oil tanks an air test was made. It was found that many leaks existed between stbd. and port tanks. In fact, it is felt that original intention was not to have a completely oil tight bulkhead but only to alleviate free-surface effect of one large tank. To reduce cross leakage and consequent reballasting, leaky seams were lead caulked.

After bulkhead on port side was found with doubler plate welded over old repair area. This was steamed out, removed and further repairs made by inserting hole in original bulkhead and ring welding pulled rivets. A new doubler plate was installed to protect bulkhead from corrosion.

Fore Peak Tank:

Several small wasted areas were doubled from inside and leaks in way of shell plate to bulkhead stopped with epoxy caulking.

General condition of inside of tank is fair to good, protected with cement wash. It is recommended that this protective coating be renewed at some future date.

Aft Peak Tank:

Bulkhead to engine room found severely wasted in way of drip from shaft gland. Temporary repairs made with doubler and epoxy but this is not satisfactory over long term. It is recommended that this bulkhead be renewed from shop level to hull at next yard period.

Again interior of tank is fair to good with cement wash. This should be renewed when possible.

Summary:

Overall condition of hull is now felt to be good. Minor pitted areas will probably have to be repaired at future yard periods and if further deterioration occurs on rivets, some of these should probably be considered for renewal in the future.

As machinery renewals progress, vessel is felt to be satisfactory for limited service as well as sound for museum purposes.

HULL AND CARGO SURVEYORS, INC.

R. A. Wehnau

RAW/mab

Requested by: S. Hastings
GGNRA